Etiology of facial fractures in elderly Finns during 2006-2007

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Objective. The purpose of the present study was to clarify the trauma mechanisms and resulting facial fractures in geriatric patients and to compare them with those of younger adults.
Study Design. A cohort of 117 geriatric patients was compared with 136 patients aged 20 to 50 years. The statistical significance of differences between the age groups was evaluated with χ^2 tests.
Results. Falls on the ground were significantly more frequent among geriatric patients ($P < .001$), whereas assault was more frequent in controls ($P < .001$). Accident rates in geriatric patients were significantly higher during the winter months ($P = .04$). Fractures of the midface in general ($P = .001$) and of the nasal bone ($P = .004$) and orbit ($P = .015$) in particular were more frequent in geriatric patients.
Conclusions. Age-related factors and preexisting medical problems predispose the elderly to falls and subsequent fractures. Footwear traction devices are recommended during the cold season. Orbital fractures should be strongly suspected in the elderly. (Oral Surg Oral Med Oral Pathol Oral Radiol 2014;118:539-545)

The occurrence of facial fractures has been found to increase as a function of age up to the age group of 30- to 40-year-olds, after which the occurrence appears to decrease.[1] In cohorts including patients with facial injuries, the proportion of geriatric patients has only been 5.3% to 8.6%.[1,5]

Geriatric facial fractures have been described based on Asian, African, American, and European patient registers,[2-5] but publications are still few and comparative studies are rare. The infrequency of facial fractures in the elderly is probably the reason why the issue has attracted relatively little attention in the literature. However, the increasing life expectancy in developed countries suggests that the significance of geriatric facial injuries will increase, and these injuries should therefore receive more attention. For example, it has been estimated that the proportion of inhabitants in Finland aged 65 years or older will grow from the present 18% to 26% by 2030.[6]

The causes of facial fractures are age-dependent. Very young children mainly sustain their injuries owing to falls and bicycle accidents, whereas the proportion of motor vehicle accidents (MVAs) and sports-related accidents increases with increasing age of the child.[7] Violence becomes apparent among teenagers[8] and has been reported to be the single most common etiology of facial fractures in adults.[1] Owing to various age-related physiologic changes and chronic illnesses, the etiologies of facial fractures, as well as the resulting facial injuries, are most probably quite different in geriatric patients compared with younger adults.

The purpose of the present study was to clarify the trauma mechanisms and resulting facial fractures in geriatric patients and to compare them with those of younger adults.

PATIENTS AND METHODS

To address the research aim, we designed and implemented a retrospective cohort study. The study population comprised 117 consecutive geriatric patients aged 65 years or older who had been diagnosed with facial fractures at a level I trauma center during the 2-year period from January 1, 2006, to December 31, 2007. From a previously published data set,[5] we identified patients aged 20 to 50 years who had been diagnosed with facial fractures and included them as younger controls (n = 136).

From the patient files, the gender, age, time of injury, trauma mechanism, and resulting facial fractures were

Statement of Clinical Relevance

The present study highlights the typical features of trauma mechanisms and fracture types in the elderly compared with younger adults. Significant differences were found between the groups, which should be taken into consideration in prevention and during diagnosis.

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identified. For the geriatric patients, preexisting medical problems and regular medication were also recorded.

The mechanism of trauma was classified as a fall on the ground, fall from height, assault, bicycle accident, MVA, sports-related accident, being hit by a blunt object, or gunshot accident. Patients who were under the influence of alcohol were recorded as such.

Facial fractures were categorized according to the site and type. The fracture site was classified as mandibular (i.e., condyle, ramus, angle, body, and symphysis/parasymphysis), midfacial (i.e., zygomatic bone, nasal bone, orbit, LeFort I-III, palate, and maxillary sinus wall), or upper third (i.e., frontal bone and anterior skull base).

Based on the distribution of fracture sites, 1 of the following 9 groups of fracture types was assigned for each patient: (1) isolated mandibular fracture (≥1); (2) isolated zygomatico-orbital fracture (i.e., tripoid zygomatic fracture or isolated zygomatic arch fracture); (3) isolated orbital fracture (i.e., isolated orbital floor, medial wall, or roof fracture, or a combination of those); (4) isolated nasal fracture; (5) isolated fracture of the wall of the maxillary sinus; (6) extensive midfacial fracture (i.e., LeFort I-III, naso-orbito-ethmoidal, or multiple midfacial fractures, or a combination of those); (7) isolated upper third fracture (i.e., fractures of the frontal sinus, anterior skull base, or both); (8) combined fractures (i.e., mandibular + midfacial fracture, midfacial + upper third fracture, or panfacial fracture extending to all facial thirds); and (9) isolated dentoalveolar injuries.

Data analysis

In the data analysis, geriatric patients were compared with younger controls with respect to gender, the time of injury (month and day of the week), trauma mechanism, and the site and type of facial fracture. The statistical significances of the associations between the age group and the covariates listed were evaluated with χ^2 tests.

Ethical approval

The Internal Review Board of the Division of Musculoskeletal Surgery, Helsinki University Central Hospital, Helsinki, Finland, approved the study.

RESULTS

Gender and age

Table I presents the gender and age distribution of geriatric patients and younger controls. The proportion of males was significantly higher among younger controls (81.6%) than among geriatric patients (45.3%) ($P < .001$). Injuries occurred more often among the younger geriatric patients, the injury rates being 27.4% in the age group 65 to 69 years but only 3.4% in those aged 90 years or older.

Table I. Gender and age distribution of 117 geriatric patients and 136 younger controls

	Geriatric patients		*Younger controls*	
	n	%	*n*	%
Gender				
Male	53	45.3	111	81.6
Female	64	54.7	25	18.4
$P < .001$				
Average age (y)	76.3		34.0	
Age range (y)	65-95		20-50	
Age group (y)				
20-24			33	24.3
25-29			17	12.5
30-34			20	14.7
35-39			28	20.6
40-44			18	13.2
45-50			20	14.7
65-69	32	27.4		
70-74	25	21.4		
75-79	20	17.1		
80-84	22	18.8		
85-89	14	11.9		
≥90	4	3.4		

Preexisting medical problems and regular medications in geriatric patients

Of the 117 geriatric patients, 89 (76.1%) had 1 or more preexisting medical problems (Table II). Heart disease was the most common of these (60.7%); 75 patients (64.1%) had regular medication, most frequently (48.7%) for cardiovascular disease (see Table II).

Time of injury

As shown in Figure 1, the highest accident rates in controls occurred during the warm period of the year (i.e., between June and September). Among geriatric patients, there were peaks in occurrence in May, September, and December. Compared with younger controls, the accident rates were significantly higher in geriatric patients during the autumn and the cold winter months. Of all injuries in geriatric patients, 56.4% occurred between September and February, the corresponding rate among controls being 43.4% ($P = .04$).

Figure 2 illustrates the accident rates per day of the week for geriatric patients and controls. In the geriatric population, the highest accident rates were observed on Tuesdays, Wednesdays, and Fridays, whereas the highest accident rates in controls were observed during the weekend, on Fridays, Saturdays, and Sundays. Altogether, 61.7% of the injuries in younger adults occurred between Friday and Sunday, the corresponding rate for the elderly being significantly less (42.7%; $P = .003$).

Table II. Medical anamnesis in 117 geriatric patients with facial fractures

Medical problem	*n*	*% of 117*
Heart disease, arterial hypertension	71	60.7
Neurologic disease	18	15.4
Diabetes mellitus	14	12.0
Respiratory disease	13	11.1
Osteoporosis	13	11.1
Malignancy	11	9.4
Psychiatric disease	9	7.7
Musculoskeletal disease	9	7.7
Alcoholism	5	4.3
Other*	21	17.9
Regular medication	*n*	*% of 117*
Cardiac therapy	57	48.7
Antithrombotic agents	43	35.8
Central nervous system–affecting drugs	25	21.4
Drugs for acid-related disorders	11	9.4
Drugs for diabetes	10	8.5
Analgesics	10	8.5
Drugs for osteoporosis	8	6.8
Anti-inflammatory medication for respiratory disease	5	4.3
Other**	24	20.5

*HepatitisB, blindness, diverticulosis, glaucoma, hypofunction of kidneys/liver/pancreas/thyroid, Ménière disease, migraine, rheumatism, struma, prostate hyperplasia.
**Medicationfor glaucoma, Ménière disease, hypothyroidism, muscle spasm, allergy, incontinence, laxatives, hormone regulations, malignancy, hypokalemia.

Trauma mechanism

Table III presents the trauma mechanisms in geriatric patients and younger controls. A fall on the ground was by far the most common trauma mechanism in geriatric patients (64.1%), followed by MVA (15.4%) and a fall from height (5.1%). The mechanism remained unknown for 5.1% of geriatric patients. In younger controls, assault was by far the most common trauma mechanism (51.5%), followed by a bicycle accident (12.5%) and a fall on the ground (12.5%).

Falls on the ground were significantly more frequent among geriatric patients than among controls (see Table III) ($P < .001$). Regarding MVAs, being hit by a motor vehicle was significantly more frequent among geriatric patients than younger controls ($P < .001$). In contrast, all controls involved in MVAs were either drivers or passengers in the vehicle. Assault ($P < .001$), bicycle accidents ($P = .021$), and sports-related accidents ($P = .005$) were significantly more frequent in younger controls than in geriatric patients.

Younger controls were significantly more frequently (34.6%) under the influence of alcohol at the time of the injury than geriatric patients (11.1%) ($P < .001$). Of the 13 geriatric patients who were under the influence of alcohol, the majority (10 patients) were male and had sustained their fracture owing to a fall on the ground. Of the 47 younger controls who were under the influence of alcohol, the majority were male (36 patients), and the majority had sustained their injury owing to assault (26 patients).

Fracture site

Table IV presents the fracture sites in geriatric patients and younger controls. Altogether, geriatric patients sustained 178 facial fractures; controls, 227. The most common fracture sites in geriatric patients were the zygomatic bone (24.7%), orbit (20.8%), nasal bone (16.9%), and condyle (14.6%). In controls, fractures were most commonly situated in the zygomatic bone (22.5%), orbit (15.9%), condyle (13.2%), symphysis/parasymphysis (11.0%), and angle (10.6%).

Fractures of the nasal bone ($P = .004$) were significantly more frequent in geriatric patients than in younger controls (see Table IV). Fractures of the mandibular angle ($P < .001$) and symphysis/parasymphysis ($P < .001$) were significantly more frequent in younger controls than in geriatric patients.

Figure 3 illustrates the distribution of fractures in the facial thirds in geriatric patients and controls. Geriatric patients had significantly more midfacial fractures than younger controls ($P = .001$), whereas controls had significantly more mandibular fractures ($P = .003$).

Fracture type

As shown in Table V, the most common fracture types in geriatric patients were isolated zygomatico-orbital (29.9%), isolated orbital (21.4%), isolated mandibular (13.7%), and isolated nasal (12.8%) fractures. In younger controls, the most common fracture type was an isolated mandibular fracture (35.3%), followed by isolated zygomatico-orbital (29.4%) and isolated orbital (10.3%) fractures.

Isolated orbital fractures ($P = .015$) and isolated maxillary sinus wall fractures ($P = .004$) were significantly more frequent in geriatric patients than in controls (Figure 4), whereas isolated fractures of the mandible were significantly more frequent in younger controls ($P < .001$).

DISCUSSION

The purpose of the present study was to clarify the trauma mechanisms and resulting facial fractures in geriatric patients and to compare them with those of younger adults.

Geriatric patients sustained their injuries more often owing to falls ($P < .001$) and during the cold winter

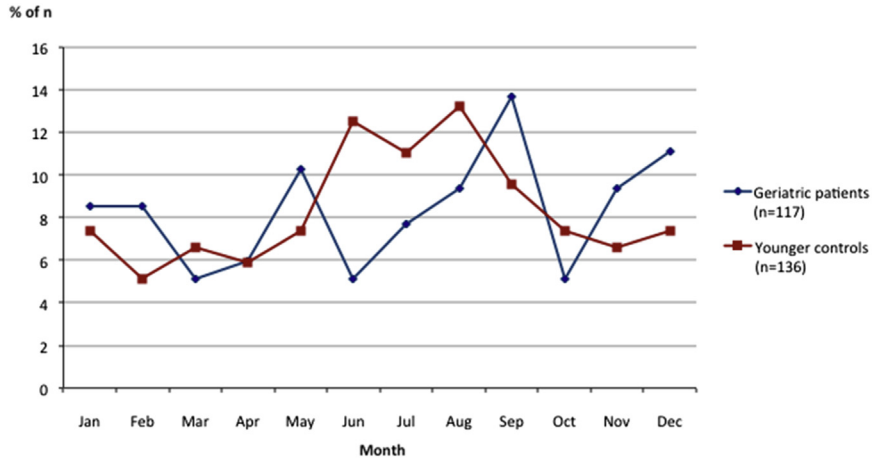

Fig. 1. Accident rates per month for geriatric patients and younger controls.

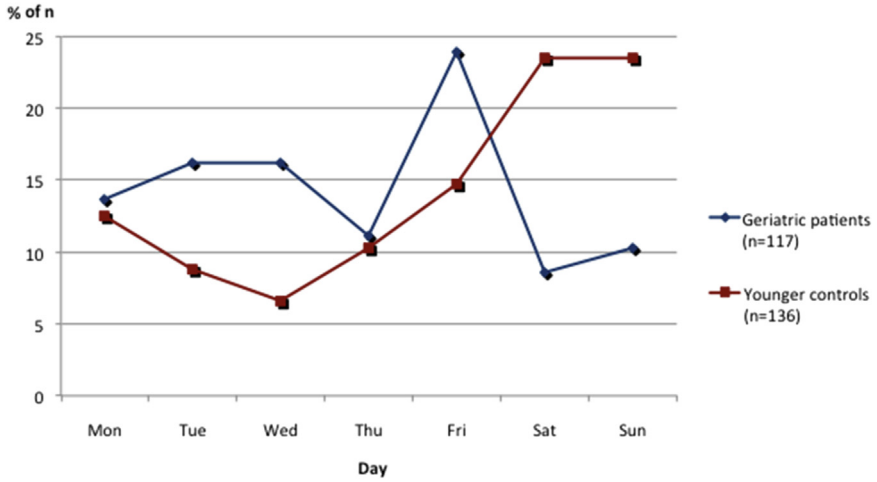

Fig. 2. Accident rates per weekday for geriatric patients and younger controls.

Table III. Trauma mechanisms in 117 geriatric patients and 136 younger controls

	Geriatric patients		*Younger controls*		
Trauma mechanism	*n*	%	*n*	%	*P*
Fall on the ground	75	64.1	17	12.5	<.001
MVA	18	15.4	13	9.6	.159
Hit by motor vehicle	13		0		<.001
Driver/passenger in motor vehicle	5		13		.103
Fall from height	6	5.1	7	5.1	.995
Unknown	6	5.1	0	0.0	.008
Bicycle accident	5	4.3	17	12.5	.042
Assault	5	4.3	70	51.5	<.001
Gunshot accident	1	0.9	0	0.0	.280
Hit by blunt object	1	0.9	3	2.2	.390
Sports-related accident	0	0.0	9	6.6	.005

MVA, motor vehicle accident.

months ($P = .04$) than younger controls. Younger controls were more frequently under the influence of alcohol at the time of the injury than geriatric patients ($P < .001$), but the intoxication rate of 11.1% observed in the elderly is still notable. In geriatric patients, midfacial fractures were more frequent than in younger controls ($P = .001$).

A study by Gerbino et al.[9] found that 55.9% of facial fractures in patients older than 60 years occurred owing to falls. In the present study, the rate of falls was slightly higher, 64.1%, perhaps because the average age of participants in the present study (76.2 years) was higher than in the aforementioned study (70.3 years). In addition, the patients in the present study had various medical problems and medications that increased the fall risk, such as cardiovascular disease, neurologic disease, and medications affecting the central nervous system.

It has been found that there are significant seasonal variations in the risk of hip, distal forearm, proximal humerus, and ankle fractures in geriatric patients, each of these injuries occurring significantly more frequently in the winter.[13] Based on the results of the present

Table IV. Fracture sites in 117 geriatric patients and 136 younger controls

	Geriatric patients		*Younger controls*		
Fracture site	*No. of fractures (n = 178)*	*% of n*	*No. of fractures (n = 227)*	*% of n*	*P*
Upper facial third					
Frontal bone	6	3.4	3	1.3	.211
Frontal skull base	4	2.2	3	1.3	.558
	10		6		
Midface					
Zygomatic bone	44	24.7	51	22.5	.487
Orbit	37	20.8	36	15.9	.214
Nasal bone	30	16.9	16	7.0	.004
LeFort I-III	10	5.6	20	8.8	.172
Palate	1	0.6	0	0.0	.280
Maxillary sinus wall	7	3.9	8	3.5	.573
Subtotal	129		131		
Mandible					
Condyle	26	14.6	30	13.2	.674
Coronoid process	1	0.6	0	0.0	.280
Ramus	2	1.1	2	0.9	.879
Angle	2	1.1	24	10.6	<.001
Body	4	2.2	9	4.0	.514
Symphysis/parasymphysis	4	2.2	25	11.0	<.001
Subtotal	39		90		

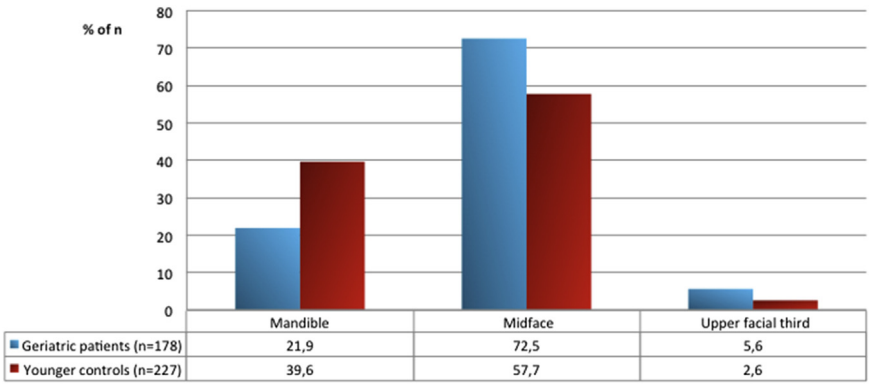

Fig. 3. Fracture sites in geriatric patients and younger controls.

study, the slippery season also predisposes the elderly to facial fractures. For prevention, footwear traction devices can be recommended.

Although the intoxication rate for geriatric patients (11.1%) was clearly lower than that for younger adults (34.6%), the rate is nevertheless significant. Three recently published studies examined alcohol use in general and at-risk drinking in particular in elderly Finns. Slightly fewer than 20% were reported to consume alcohol for medical use, most commonly for cardiovascular diseases, sleep disorders, mental disorders, common colds, and indigestion.[10-12] Although the amounts consumed for medical use were typically small, alcohol use was associated with forgetting to take medicines and worries among relatives, as well as falls and fractures.[10] The authors emphasized that older people may have misconceptions about the medical use of alcohol, and it also appears as a risk factor for elderly facial trauma. Facial surgeons have a responsibility to intervene whenever a geriatric facial injury is associated with alcohol use.

Our study found that geriatric patients sustained significantly more midfacial fractures than younger adults. Of the 178 geriatric fractures recorded in this study, 72.5% were situated in the midface, the rate being similar to that of 71% observed by Gerbino et al. (1999).[9] The most common type of geriatric midfacial injury in the present study and in that of Gerbino et al.[9] was a zygomatico-orbital fracture. However, a more detailed analysis of midfacial fractures in the present study found that there was no significant difference in the occurrence of zygomatico-orbital fractures between geriatric patients and younger controls. By contrast, nasal bone fractures ($P = .004$), isolated orbital fractures

Table V. Fracture types in 117 geriatric patients and 136 younger controls

	Geriatric patients		*Younger controls*		
	No. of fracture types (n = 117)	*% of n*	*No. of fracture types (n = 136)*	*% of n*	*P*
Isolated zygomatico-orbital	35	29.9	40	29.4	.930
Isolated orbital	25	21.4	14	10.3	.015
Isolated mandibular	16	13.7	48	35.3	<.001
Isolated nasal	15	12.8	10	7.4	.146
Combined	12	10.3	10	7.4	.414
Extensive midfacial	6	5.1	9	6.6	.617
Isolated wall of the maxillary sinus	6	5.1	1	0.7	.004
Isolated upper third	2	1.7	3	2.2	.777
Isolated dentoalveolar	0	0.0	1	0.7	.353

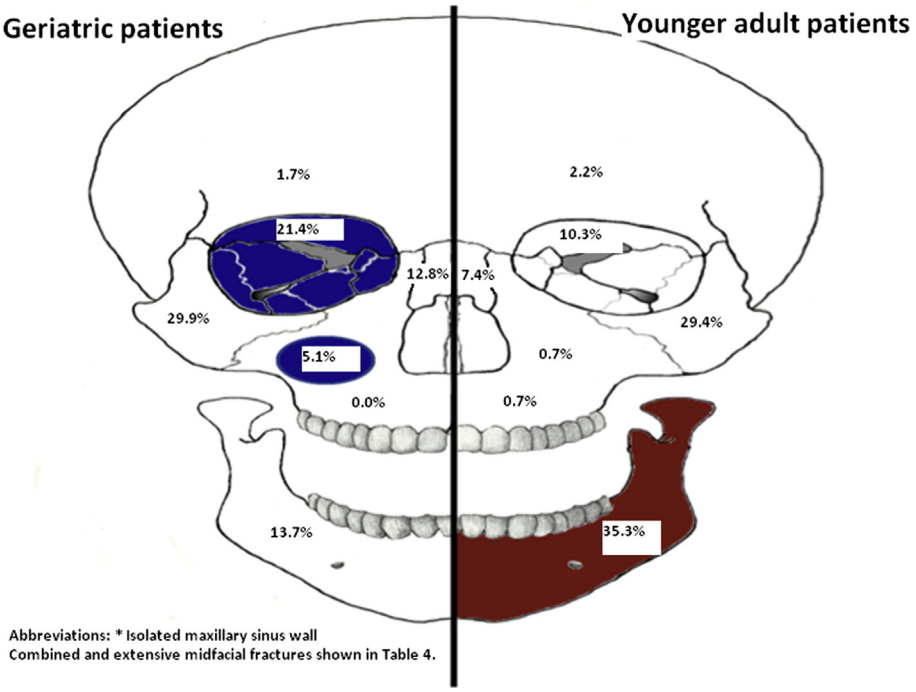

Fig. 4. Types of fracture between groups; significant differences.

($P = .015$), and isolated fractures of the maxillary sinus wall ($P = .004$) were more common among the elderly. Isolated orbital fractures were particularly frequent (21.4%), indicating that an orbital blow-out fracture should be strongly suspected in elderly patients with midfacial trauma.

CONCLUSION

Geriatric patients most commonly sustain facial fractures owing to a fall on the ground, and falls more frequently occur during the winter months in this group than in younger patients. Age-related factors, such as poor coordination, protracted reactivity, and deteriorating eyesight and hearing, as well as medical problems and medications increasing the preexisting fall risk, are predisposing factors. Footwear traction devices can be recommended during the cold and slippery seasons. An orbital blow-out fracture should be strongly suspected in an elderly patient with signs of midfacial trauma.

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